PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
B41F 33/00, G03F 1/04

A1

(11) International Publication Number: WO 98/42509

(43) International Publication Date: 1 October 1998 (01.10.98)

(21) International Application Number: PCT/BE98/00041

(22) International Filing Date: 24 March 1998 (24.03.98)

(30) Priority Data:
08/823,822 25 March 1997 (25.03.97) US

(71) Applicant: BARCO GRAPHICS N.V. [BE/BE]; Tramstraat 69, B-9052 Zwijnaarde (BE).

(72) Inventors: BOURDEAUD'HUI, Antoine; Noordlaan 35, B-9630 Zwalm (BE). ROMMELAERE, Johan; Broekstraat 106, B-3001 Heverlee (BE). PIETERS, Freddy; Boerderijstraat 103, B-9000 Gent (BE).

(81) Designated States: JP, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(54) Title: A METHOD FOR PROOFING IMPOSED DOCUMENTS

(57) Abstract

A method of imposition proofing of printing data of a document onto a set of proof sheets is described, the document having one or more sections, each proof sheet having a recto side and a verso side, the printing data including imposing information and printing information for positioning and printing a set of pages onto one or more print sheets, each print sheet having two print sheet sides, a verso print sheet side and a recto print sheet side, each print sheet side having at least four pages. The method includes ,for each print sheet in the printing data, dividing the pages imposed on each side of the print sheet into printer spreads of two pages, and determining information referencing the printing data, for defining how each printer spread is printed on each side of a proof sheet.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

A METHOD FOR PROOFING IMPOSED DOCUMENTS

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to preparing documents for printing. In particular, this invention relates to a method for proofing imposed documents, for example books, magazines and brochures, on a proofing medium.

Description of the Prior Art

Generally, modern production techniques for documents such as books, magazines and brochures, can be split into three major stages:

1. Prepress. In the prepress stage of production, media are prepared for a printing device. The output of this stage is an imaged film, plate, cylinder or, in the case of digital printing presses, digital data. One of the steps in the prepress stage is imposition. This step ensures that each page of the document is placed on the proper printing sheet in the correct orientation.

2. Printing. During this stage of production the information produced by the prepress system is duplicated on sheets of output medium using a press, a digital printing system, or some other duplicator of printed material.

3. Finishing. In this stage the printed sheets of output medium are folded, assembled and cut to form the final documents.

Since stages 2 and 3 generally are used for high volume work, the fixed cost of stage 1 and the set up of printing and finishing is very high compared to the variable marginal cost of printing one document. Errors discovered only in the printing or finishing stages tend to be very expensive. Professional printers thus want to see a simulation of the result of stages 2 and 3 before actually

CONFIRMATION COPY

performing these processes. They also need to be able to provide proofs that give customers a clear impression of how the actual printed document will look.

Imposition usually is carried out on a computer, using an imposition software program which takes the individual pages of a document and lays the pages out on large sheets ("print sheets"), several pages to a sheet, so that after printing, the print sheets can be folded and cut to generate one or more subsets ("sections") of the document which are then combined to form a complete document. Typical prior art imposition programs generate printing data comprising at least one computer tile containing information about the position of the pages on sheets of output medium ("print sheets") as well as the content of these pages. Typically, the printing data might contain references to other files which describe the contents of the individual pages, such other files including, for example, line art images, continuous tone images, text, fonts, *etc.* Each print sheet includes a recto side and a verso side. At least four pages are imposed on a single side of a print sheet, and some of these pages may be blank.

It should be noted that the words impositioning and impositioned are sometimes used for the words imposing and imposed, respectively.

Up to now, different proofing methods have been used to produce proofs of imposed documents from printing data produced by an imposition program. Known proofing methods produce flats, large sheets containing images for at least four pages in the resulting document. These flats have to be folded in a specific way, possibly after being combined with one or more other flats, and then cut to obtain a simulation of the document to be printed. Folding and cutting the flats is a very labour-intensive process.

Blueprint proofing methods start with film and make one copy of a printed sheet by a photo chemical process. The primary disadvantage of these methods is that they are expensive in consumption of consumables, due to the special paper and chemical products used. Additionally, in these methods,

normally only one or two separations are transferred to the paper. By consequence, the resulting proofs cannot be used as a content proof for pages containing more than two separations, for example in four-colour printing. Furthermore these methods can only be used where film is the output of the prepress stage. Nowadays, the printing industry is shifting more and more towards computer-to-plate production, in which film is no longer used, and thus blueprint proofing can no longer be used.

Another prior art proofing method is the use of a short run proofing press. This is a small press which has a lower start up cost than a full scale printing press, the press on which the real printing stage of the document takes place. The proofing press is used to print only a small amount of examples. The same plates are used in the proofing press that are used on the printing press and therefore this method has the disadvantage that the format of the proofing press must be at least the format of the printing press. Furthermore, although smaller costs are to be foreseen for starting up a short run proofing press, a high initial investment is needed for such a press.

A third proofing method involves page proofing and imposition proofing separately. In this method the pages are proofed unscaled on an electronic proofing device. Then the imposed sheets are downscaled to form a "mechanical" proof which shows whether pages are aligned correctly. The imposition proof has to be folded and cut, which again is labour-intensive, although a larger proofer can produce larger imposed sheets that do not require downscaling. The two main disadvantages of this method is that two proofs must be made and checked separately and that a physical model of the document as it will be printed eventually is not available to show to the customer.

Thus, there is a need in the art for a method of simulating on a proofing medium the printed results of printing an imposed document, the method avoiding folding and cutting.

One of the problems of proofing is that there is a chance that the printed proof will not be printed with the same data (photographs, text, *etc.*) as the final printing output. This can come about, for example, by some of the images used being modified during the time between proofing and final printing. Thus there is a need in the art for mechanisms that aid checking for correct placement and for version control in proofing.

SUMMARY OF THE INVENTION

Objects of the invention

It is an object of the present invention to provide a method and an apparatus for simulating on a proofing medium the results of printing an imposed document, the imposed document generated, for example, by an imposing, so that the sheets of proofing medium no longer require a labour-intensive cutting step.

This simulation generates through a digital proofer the same type of recto/verso printer spread sheets one can get by disassembling the eventually finished document. These printer spreads from the proof printer can easily be collated in the same way the real document will be after cutting, and thus simulate the printing and assembling of the document.

It is a further object of the present invention to provide a method and an apparatus for including marks in the proof of the results of printing an imposed document, the marks providing an aid for checking for correct placement and for version control.

Overview of the invention

In accordance with the present invention, a method is disclosed for imposition proofing of pages on sheets of proofing medium ("proof sheets ").

The method described starts from printing data produced by an imposition program, this printing data containing information about the position of the pages on sheets of output medium ("print sheets") as well as information about the content of these pages. A "page" so defined therefore may be a blank page. Each print sheet has a recto side and a verso side. The pages imposed on each side of a print sheet are divided in sets of two pages ("printer spreads"), and one or more of these pages may be blank. The document consists of sections, and each section has at least four pages. The number of sections in the document and the number of pages per section in the document are provided by the user. The method produces proofer data for printing sides of proof sheets, each proof sheet having two sides, a recto side and a verso side. The proofer data states how each printer spread (set of two pages) is printed on each side of a proof sheet, as well as the order of arranging the proof sheets.

According to one preferred embodiment, a method for imposition proofing is disclosed which includes selecting from printing data those pages positioned before the middle of each section. The method includes positioning on a side of a proof page each selected page together with its partner page in its print spread, and outputting that positioning information as part of the proofer data. The method also includes determining the logical place (the order) for the proof page side containing the selected page, including whether that page is printed on a recto or verso side of the proofer data, and outputting the ordering information as part of the proofer data.

According to an improved embodiment of the present invention, the method also includes adding one or more extra marks to the proofer data, these extra marks determined from the printing data to aid checking for correct placement and for version control. According to one embodiment, these extra marks are one or more of: the name of the page, the date of proofing, a rectangle around the unfinished format, a rectangle around the finished format, and a rectangle around the text area of the page. According to another embodiment, an extra mark is added to the proofer data comprising a number (herein called a

"magic number") which is a function of the images, pages and sheets actually used to make the proof. A number then can also be added to the printing data which is a function of the images, pages and sheets actually used to make to output the printing data in preparing the film or plate. The function is chosen so that if the magic number on the film or plate is the same as on the proof, there is an extremely high likelihood that these were made using the same data, and if the magic number on the film or plate does not match that on the proof, then there is certainty that the data used to proof is different from that used to prepare final output.

An apparatus for imposition proofing also is disclosed, taking as input printing data and outputting proofer data. The apparatus includes means for selecting from the printing data those pages positioned before the middle of each section. The apparatus also includes positioning means coupled to the selecting means for positioning the selected pages together with their partner pages on a side (recto or verso) of a proof page, and outputting that positioning information as part of the proofer data. The apparatus may also include order determining means coupled to the selecting means, for determining the logical place (the order as ordering information) for the proof page side containing the selected page, such ordering information including whether a page is to be printed on the verso side or recto side of the proof pages, and outputting the ordering information as part of the proofer data. According to a preferred embodiment of the present invention, the apparatus also includes marking means coupled to the selecting means, for adding extra marks to the proofer data, these extra marks determined from the printing data to aid checking for correct placement and for version control.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description taken together with the drawings and annexes in which:

Figure 1 is a block diagram of a typical computer system (Prior Art) in which the present invention may be embodied;

Figure 2 shows 32 pages of a sample magazine as they come into an imposition program (Prior Art);

Figure 3 shows the 32 pages as they might come out of a typical imposition program (Prior Art) in a possible 8-up case used herein as an example;

Figure 4 (a) and 4 (b) represent, as an example, how pages coming out of an imposition program are put on proof sheets according to the method of the present invention;

Figure 5 shows, as an example, the different sides of proof sheets each containing two pages;

Figure 6 shows a flow chart producing proofer data according to the method of the present invention;

Figure 7 shows part of the flow chart of Figure 6 in more detail;

Figure 8 shows an overview of the method of the present invention;

Figure 9 shows the preferred embodiment of using the method of the present invention; and

Figure 10 shows an overview of the apparatus of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of the present invention is a method implemented on a computer. The steps of the method are performed by the computer executing a software program.

Figure 1 is a simplified block diagram of a computer system 10 in which the present invention may be embodied. The computer system configuration illustrated at this high level is standard, and as such, Figure 1 is labeled "PRIOR ART." A computer system such as system 10, suitably programmed to embody the present invention, however, is not prior art. The specific embodiments of the invention are embodied in a general-purpose computer system such as shown in Figure 1, and the remaining description will generally assume that environment. However, the invention may be embodied in dedicated devices such as printer servers, and printer controllers.

In accordance with known practice, the computer system includes a processor 12 that communicates with a number of peripheral devices via a bus subsystem 15. These peripheral devices typically include a memory subsystem 17, a user input facility 20, a display subsystem 22, output devices such as a printer 23, and a file storage system 25.

In this context, the term "bus subsystem" is used generically so as to include any mechanism for letting the various components of the system communicate with each other as intended. With the exception of the input devices and the display, the other components need not be at the same physical location. Thus, for example, portions of the tile storage system could be connected via various local-area or wide-area network media, including telephone lines. Similarly, the input devices and display need not be at the same location as the processor, although it is anticipated that the present invention will most often be implemented in the context of personal computers ("PCs") and workstations.

Bus subsystem 15 is shown schematically as a single bus, but a typical system has a number of buses such as a local bus and one or more expansion buses (*e.g.*, ADB, SCSI, ISA, EISA, MCA, NuBus, or PCI), as well as serial and parallel ports. Network connections are usually established through a device such as a network adapter on one of these expansion buses or a modem on a serial port. The computer system may be a desktop system or a portable system or an embedded controller.

Memory subsystem 17 includes a number of memories including a main random access memory ("RAM") 30 and a read only memory ("ROM") 32 in which fixed instructions are stored. In the case of Macintosh-compatible personal computers this would include portions of the operating system; in the case of IBM-compatible personal computers, this would include the BIOS ("basic input/output system").

User input facility 20 typically includes a keyboard 40 and may further include a pointing device 42 and a scanner 43. The pointing device may be an indirect pointing device such as a mouse, trackball, touchpad, or graphics tablet, or a direct pointing device such as a touchscreen incorporated into the display.

Display subsystem 22 typically includes a display controller 44 and a display device 45 coupled to the controller. The display device may be a cathode ray tube ("CRT"), a flat-panel device such as a liquid crystal display ("LCD"), or a projection device. Display controller provides control signals to the display device and normally includes a display memory (not shown in the figure) for storing the pixels that appear on the display device.

The file storage system provides persistent (non-volatile) storage for program and data tiles, and typically includes at least one hard disk drive 46 and at least one floppy disk drive 47. There may also be other devices such as a CD-ROM drive 48 and optical drives. Additionally, the system may include hard drives of the type with removable media cartridges. As noted above, one or more

of the drives may be located at a remote location, such as in a server on a local area network or at a site on the Internet's World Wide Web.

In the preferred embodiment; the proofing medium is smaller than the actual output medium. The invention covers also the general case. The proofing medium has two pages per side, while the output medium comprises sheets (print sheets) of at least four pages per side, some of these pages possibly being blank. The method described starts from final printing data produced by an imposition program, this final printing data being at least one file containing information about the position of the pages on the print sheets of output medium as well as the content of these pages. Each print sheet has a recto side and a verso side.

The method of the present invention produces data for generating proof sheets, typically but not necessarily on a digital proofer. The pages imposed on each side of a print sheet are divided by the method of the present invention into proof exposures of two pages each, one or more of which may be a blank page. Each proof exposure of two pages is eventually printed on one side of a proof sheet. With two sided printing, each proof sheet thus consists of two parts, a recto part and a verso part, each part corresponding to two pages in the document. The different proof sheets are folded once and collated so as to form at least one section, where section means the parts of an eventual document as they are after insertion but before they are bound together. The place where each proof sheet is folded forms the spine of the section. If more than one section has been formed, then the sections need not be stacked together in the right order to form the simulated book. The sections are such that they represent the sections of the final document, enabling the one to check size, position, and other imposition qualities.

In the preferred embodiment of the method of the present invention, at least one proofer output file is generated from the printing data generated by the imposition program. The proofer data, in the form of proofer output file (or files) contains information about which pages from the printing data will have to be

printed on each proof sheet and in which way. The printing data, later used to generate the final imposition output (film or plate), is used by the method of the present invention for the proof, but remains untouched. No new data is generated to form the proofer data; rather, references to the printing data file are assembled. Alternate implementations of the invention may generate separate proofer data and printing data files, the proofer data containing new data.

When proofer data, typically proofer output files, are sent to a digital proofer, the proofer output files are printed on the proofing medium by means of the digital proofer. In this way the different proof sheets are generated. A duplex proofing medium (that is, automatic two-sided printing) provides the optimal case, although the preferred embodiment can easily be modified to work well with a proofing device that does not do automatic two-sided printing. How to carry out such a modification would be clear to those of ordinary skill in the art.

By way of example, the method of the present invention will be described for proofing a sample magazine containing thirty-two pages, as shown in Figure 2. Each page is shown as a rectangle. Page 1 is denoted 201, page 2 is denoted 202, ..., page 31 is denoted 231; and page 32 is denoted 232, respectively. The page number is shown in each rectangle in Figure 2. See for example the "32" (denoted 253) on page 32 (denoted 232). The white arrow on each page points in the upward direction of that page, for example, the arrow 251 on page 32. The final produced magazine of this example consists of two sections, each containing sixteen pages. A section typically consists of a number of print sheets folded together and forming part of the magazine. Although in the example, all the sections have the same number of pages, the invention works equally with documents that have sections of an unequal number of pages.

In a typical computer program for imposing, for example, the Impose!™ program from Barco Graphics, the assignee of the present invention, for the sample magazine, each of the thirty-two pages comes into the program in ascending order, and is imposed by the program on sides of print sheets. The

output of the imposition program is the printing data, and includes references to all the data which needs to be printed, for example, references to the data files containing the images, text, fonts, *etc.* Print sheets are large sheets of output medium used for printing a document. For a typical document, the print sheets may be printed on both sides. For the example, assuming eight pages can go on one side of a print sheet, then the whole of the sample magazine to be printed would typically be imposed on the four sides of two print sheets as shown in Figure 3 and numbered 1 and 2, respectively, with "Recto 1" and "Verso 1" being the recto and verso sides, respectively, of sheet 1, and "Recto 2" and "Verso 2" being the recto and verso sides, respectively, of sheet 2. The imposition program causes some of the pages to be turned upside down, as shown by some of the white arrows pointing down in Figure 3. This is in order to enable these pages to be in the correct position when the print sheets are folded. For example, on the print sheet side denoted 301, (the recto side of print sheet 1), page 8 (item 315) needs to be printed upside down as indicated by white arrow 317 pointing down, while page 1 (item 311) is printed on that side 301 right side up. Such imposing of pages on sides of print sheets is known in the prior art.

The black arrows, represented on each side of a print sheet in Figure 3, for example, arrow 309 on side 301, point to the upward direction of that print sheet. Recto 1 (the recto side of the print sheet 1) is labeled 301 while Verso 1 (the verso part of that print sheet) is denoted in Figure 3 by 303. The Recto 2 is denoted 305 while Verso 2 is denoted in Figure 3 by 307. When printed in this manner, folded and cut, the first print sheet (sides 301 and 303) forms the first section of the magazine, while the second print sheet (sides 305 and 307) forms the second section. The first and the second sections are then bound together to form the actual magazine.

The imposition program outputs printing data for printing print sheets 1 and 2 of sides 301, 303, 305, and 307 according to the data shown in the example of Figure 3. The data of the pages of the document may be in black and white or in colour, may contain images, the images may be line art images, continuous

tone images, or both. Thus the printing data may include data for a single monochrome print, or may include colour separations, or other forms of data needed to print the print sheets. The printing data may be used to generate film for producing plates, or may go directly to a platemaker, or may go directly to a direct digital print engine. The method of the present invention is applicable to all such situations.

The printing data produced by Impose!™, the imposition program used in the preferred embodiment, includes two formats, called the "unfinished format" and the "finished format", respectively. The unfinished format includes page windows (clipping masks for viewing pages in the print) that are slightly larger, typically by a few millimetres, than the page windows for the finished format. The unfinished format is the format to which the final print sheet is folded, the finished format is the format to which the book is trimmed. The preferred embodiment of the present invention uses the unfinished format for imposition proofing, and this enables a person reading the proof to see more than would be visible if the finished format was used, and thus enable such a person to make adjustments based on such a proof

According to the preferred embodiment of the method of the present invention, two pages forming a set (a "printer spread") are printed next to each other on one side of a proof sheet which has at least the same height as and twice the width of the unfinished format of the resulting magazine. In an alternate embodiment, if the proof sheets are smaller, the data may be downscaled in order to fit in two pages on one proof sheet side so that in any case, each printed side of a proof sheet contains two pages. Thus, piles of proof sheets can be folded in two. By collating all these folded piles of proof sheets together, they will form the same sections as are formed in the real job after folding and inserting, but before binding and trimming. Trimming means the cutting of one or more sections in one cut. The proofed document, on the other hand, does not require trimming to be readable, since the pages are only connected over the spine.

The preferred embodiment of the imposition proofing method of the present invention is shown in Figure 8. The printing data 801, generated by the imposition program and comprising data as to how the pages of the magazine are imposed in the imposed print sheets, is used by the method to form additional output, the proofer data 811, in the form of one or more proofer output files which comprise electronic data to be sent to the proofer containing instructions to print the pages in another sequence than specified in printing data 801. In the general case, variable *nsheets* is the number of print sheets that are in printing data 801 as determined in the imposition program, each print sheet having a recto and a verso side, each of the two sides of sheet k, $1 \leq k \leq nsheets$, containing $ncolumns_k$ columns and $nrows_k$ rows, $ncolumns_k$ and $nrows_k$ determined again by the imposition program. If *ntotal* is the number of pages of the output document, *nproofsides*, the number of sides of proof sheets in the proofer data 811 that the proofer eventually will have to print is *ntotal* divided by two, as two pages will be printed on each side of a proof sheet. Some pages may be blank. The number of sections in the magazine is *nsections*. In the example, each sheet contains only one section, so *nsheets* = *nsections*. Denoting the number of pages in each section j by $nsectionpages_j$, $1 \leq j \leq nsections$, for the sample magazine, $nsectionpages_j = 2*ncolumns_j*nrows_j$. In the general case, there can be multiple sections on one sheet or one section on multiple sheets, so that $nsheets \neq nsections$. In the general case, the value of $nsectionpages_j$, for each section is defined by the user. Note that

$$ntotal = \sum_{j=1}^{nsections} nsectionpages_j .$$

For the sample magazine, there are two print sheets, each corresponding to one section (*nsheets* = *nsections* = 2), each sheet having a recto and a verso side, each side containing four columns ($ncolumns_k = 4$, $k = 1, 2$) and two rows ($nrows_k = 2$, $k = 1, 2$) of pages. Thus, $nsectionpages_j = 16$, $j = 1, 2$, and *ntotal* = 32. The method includes step 803 for selecting from printing data 801 those pages positioned before the middle of each section. For the present example, selecting step 803 selects pages 1 through 8 from the first section and

pages 17 through 24 from the second section. Equivalently, one may implement the method of the present invention by choosing those pages positioned after the middle of each section, and alternate embodiments may use the alternately selected pages.

The selected pages are positioned together with their partner pages in step 805 on a side of a proof page. In addition, the logical place (the order) for that proof page side is determined in step 807. According to a preferred embodiment of the present invention, extra marks are added in step 809 to the proofer data 811. These extra marks are to aid checking for correct placement and for version control.

In the preferred embodiment, steps 803, 805, 807 and 809 are implemented in the form of computer program instructions which operate on computer system 10. These computer program instructions are incorporated into the main imposition program, although clearly alternate implementations are possible with the proofing method of the present invention running as a separate program from the main imposition program. Printing data 801 and proofer data 811 are data files in file storage system 25.

The preferred embodiment of the method for doing this is now explained with the aid of the flow charts of Figure 6 and Figure 7. Selecting step 803 looks at one page at a time from printing data 801. The following relationships are first defined. Denoting the page number encountered at any time by *presentpage*, the current section being processed by j, $j = 1, \ldots,$ *nsections*, the number of pages in all previous sections by $nprevious_j$, $j = 1, \ldots,$ *nsections*, and the page number within the current section as $current_j$, then

$$nprevious_j = 0, \qquad j = 1$$

$$nprevious_j = \sum_{m=1}^{j-1} nsectionpages_m, \qquad j = 2,\ldots,nsections, \quad and$$

$$current_j = presentpage - nprevious_j, \qquad j = 1,\ldots,nsheets.$$

In the preferred embodiment, the particular section being processed at any time is not explicitly stored. Rather, initially, a list of "thresholds" is built from the definition of the complete document input by the user. The threshold list contains, in order, $nsectionpages_j$, the number of pages in all sections prior to current section j. The list preferably is built by adding $nsectionpages_j$ to the previous entry in the list. That is, the list is built by:

$nprevious_1 = 0$;
for $j = 2$ to *nsections* do
    $nprevious_j = nprevious_{j-1} + nsectionpages_j$
endfor;

The list thus contains ($nprevious_1$, $nprevious_2$, ..., $nprevious_{nsections}$). For example, for a publication which has three sections of 16, 8, and 4 pages, respectively, the threshold list will be (0,16, 24). For the sample magazine, the threshold list is (0,16, 32).

The above description is for sections that are collated; that is, sections that come in order. It is also possible to have sections that are not in order, and sections that are inserted inside each other. In the preferred embodiment, each section that contains one or more other sections is considered a single section with the value of *nsectionpages* for that section being the sum of *nsectionpages* for that section and all enclosed sections.

Pages selecting step 803 looks at page *presentpage*, one at a time, and selects those pages which will be in the first half of the current section j in the final document. That is, pages for which $1 \le current_j < nsectionpages_j/2$. The section number j is not explicitly determined. Rather, the value in the threshold

list which is the largest number less than or equal to *presentpage* is determined. This number is $nsectionpages_j$ for current section j. This then allows one to determine $current_j$ ($current_j = presentpage - nprevious_j$), $nsectionpages_j$, and whether or not $1 \leq current_j < nsectionpages_j/2$. Note that of these selected pages, the odd numbered pages will print on the recto sides of the proof pages, oriented to the right of the centre (the "spine"), and the even pages will print on the verso sides of the proof pages to the left of the spine. For pages that that are in the second half of each section, that is, for pages that satisfy $nsectionpages_j/2 < current_j \leq nsectionpages_j$, the opposite is true: odd pages will print on the verso sides of the proof pages and the even pages will print on the recto sides.

In addition to the method which includes determining the quantity $current_j$ as described above, there are many ways within the scope of the present invention of selecting those pages that are in the first half of any section. In addition, the invention can also be implemented by selecting pages that are in the second half of any section.

The pages in the printing data are not encountered in a sequential order by selecting step 803. When any of these pre-middle of the section pages is found, a reference is made in the proofer data 811 to the printing data 801, in particular to the side of the print sheet on which the page is found. When proofing, the controller of the proofing device, typically, the proofer raster image processor ("RIP") in the proofer, replaces the reference with the actual information contained in printing data 801. This is shown in Figure 9, where proofer RIP 903 uses as input proofer data 811 which includes references to the printing data 801. RIP 903 takes from printing data 801 references to the actual data of each page to be output, this data being image files, text files, etc., and shown as item 905 in Figure 9. Making a reference to printing data 801 rather than copying the real content to the proofer data 811 makes this implementation of the method of the present invention fast and compact. It also makes it easy to keep the proof sheet up-to-date with the print sheet. More importantly, this

method guarantees that the proof is made with data from the same file eventually used for making the imposed film or plate. This makes the proof consistent with the final film or plate, as long, of course, as no data is changed between RIPing for proofing and RIPing for printing.

The flow chart of Figure 6 shows how every page in the imposed printing data 801 is examined for selection in selecting step 803. Step 603 is an initialisation step, and includes determining the threshold list ($npreviously_1$, $npreviously_2$, ..., $npreviously_{nsections}$) of the number of pages in previous sections. Step 605 initialises the loop for examining sheet by sheet, starting with sheet 1, the loop starting with step 606 and looping back with steps 625 and 627 after all the sheets have been processed. Step 606 initialises the loop for examining both sides of each sheet, starting with the recto side, the loop starting with step 607 and looping back with steps 621 and 623 after both the recto and verso sides have been processed. Step 607 initialises the loop for examining each side row by row, starting with row 1, the loop starting with step 609 and looping back with steps 617 and 619 after all the rows have been processed. Step 609 initialises the loop for examining each row column by column, starting with column 1, the loop consisting of step 610 detailed in Figure 7, and looping back with steps 613 and 615 after all the columns of the row have been processed. Thus, step 611 processes a particular column $column_k$ ($1 \leq column_k \leq ncolumns_k$) in a particular row row_k ($1 \leq row_k \leq nrows_k$) in a particular side $side_k$ ($side_k$ = recto or $side_k$ = verso) in a particular print sheet k ($1 \leq k \leq nsheets$) in printing data 801.

Many implementations are possible within the scope of the present invention for processing all the pages of a document. The above preferred embodiment is only one such implementation.

Figure 7 shows step 610 in detail. Figure 4(a) shows the processing of the flow charts of Figure 6 and Figure 7 for the first section, which also is the first sheet of printing data 801 shown in Figure 3. Initially, the present page, denoted

presentpage, is the page for $column_k$ = 1, row_k = 1, $side_k$ = recto, and k = 1. Thus, at first, *presentpage* = 4. This situation is shown in Figure 4(a)(i). Step 703 initialises variables, and step 705 determines whether *presentpage* is in the first half of the present section. This is done by looking the largest number in the list $\leq$ *presentpage*, 0 in this case. Thus, $nprevious_j$ = 0, and $current_j = presentpage - nprevious_j$ = 4. This is less than $nsectionpages_j/2$ = 8, so this page is selected. That is, the page is determined to be in the first half of the present section. Following the flowchart of Figure 7, the method proceeds to step 711 to start positioning step 805. For step 711, since the sheet already is oriented so that page 4 is up, the method proceeds to 713, the second part of positioning, step 805. The print sheet is now oriented by this step 713 so that the spine (*i.e.*, the centre) of the current proof page is correctly located to the right of the page for the verso case or to the left of the page for the recto case, midway between the current page and the page located to the right (verso case) or left (recto case). In this case, the sheet 1 is moved so that the proof page has the spine midpoint between pages 4 and 13.

The side of the proof sheet on which any two pages (at first, pages 4 and 13) are positioned has a logical place number, denoted *proofside*, calculated in step 715, which corresponds to step 807 in Figure 8, in the following way:

$$proofside = current_j + nprevious_j/2 = presentpage - nprevious_j/2.$$

As page 4 is the fourth page in the first section, $nprevious_j$ = 0, and $current_j$ = 4, respectively, and the value of *proofside* is 4. Odd values of *proofside* indicate the recto side of a proof sheet, and even values of *proofside* indicate the verso side of a proof sheet. Thus, the first proof sheet consists of sides with *proofside* values 1 and 2, the second with *proofside* values 3 and 4, *etc*. Thus, the first proofer data prepared is the second (verso) side of proof sheet 2.

In the preferred embodiment, the placed proof page outline forms a clipping mask for the side of printing data 801 being examined. As described before, the printing data includes both the unfinished format and the "finished format". The preferred embodiment of the present invention uses the unfinished

format for proofing. Thus, the clipping mask for the side of printing data 801 being examined is formed from unfinished format data. This is shown as item 401 in Figure 4(a). The part of the recto side 301 of the first print sheet not within the clip mask, that is not included in the unfinished proof page, is clipped away when printing the proof pages.

The next page is now examined: the page for $column_k = 2$, $row_k = 1$, $side_k$ = recto, and $k = 1$. That is, now *presentpage*= 13. This situation is shown in Figure 4(a)(i). Page *presentpage* is in the second half of a section, so, it will be printed on the verso side of a proof sheet to left of the spine of the folded section. Following the flow chart of Figure 7, this is not one of the pages that was sought in selecting step 803 and nothing is done with it.

The next page encountered is page 16. Again this is in the second half of the section, so is not one of the pages that is sought and nothing is done with it.

The next page is page 1, which is in the first half of the section. Thus, it is one of the pages looked for. Thus the method moves to step 711 of the flow chart. Nothing is done in step 711 because the orientation is already with page 1 head up. In step 713, this page and the page that will be on the opposite side of the spine in the eventual magazine, page 16, are positioned on one side of a proof sheet so that the area between the two pages, where the spine of the section will be formed during finishing, is positioned on the centre of the proof sheet. The outline of the proof sheet is shown as 403 in Figure 4(a)(ii) The side of the proof sheet on which the pages 1 and 16 are positioned has a logical place number *proofside* = 1, which is determined in step 715. Thus, this is the recto side of proof sheet 1.

The end of the first row of the recto side of the first print sheet has now been reached. The first page encountered in the second row is page 5. This is a page in the first half of a section, so is selected. In step 711, the recto side of the first print sheet is oriented so that page 5 is head-up. This is shown in Figure

4(a)(iii). in step 713, this page and the page coming on the opposite side of the spine in the eventual magazine, page 12, are positioned on a side of a proof sheet so that the area between the two pages, where the spine of the section will be formed during finishing, is positioned on the centre of the proof sheet. The side of the proof sheet on which the pages 5 and 12 are positioned has a logical place number 5, determined in step 715. Thus, this is the recto side of proof sheet 3.

The next two pages encountered are pages 12 and 9 which are both in the second half of the section, and thus are not processed. The next page is page 8. This is in the first half of a section, and thus a page which is selected. Here again, in step 711, the recto side of the first print sheet is oriented so that page 8 is head-up. Then, in step 713, this page and page 9, the page that will be on the opposite side of the spine in the eventual magazine, are positioned on one side of a proof sheet so that the area between the two pages where the spine of the section will be formed during finishing, is positioned in the centre of the proof sheet. The logical place number *proofside* for the side of the proof sheet on which pages 8 and 9 are positioned is determined to be 8 in step 715. Thus, this is the verso side of proof sheet 4.

In this way each of the pages on the recto side of the first print sheet are checked. The verso side of the first print sheet and the recto and verso sides of the second print sheet are processed in the same way. Figure 4(b) shows the processing of the second sheet of printing data 801. Thus, after each and every side of the different print sheets are checked, all proof pages are ready to be sent to the proofer to produce the proof sheets. These pages are arranged together in the right order for proofing in the proofer data. Without deviating from the scope of the present invention, this proofer data may be in the form of one multipage proofer output file, which contains multiple pages in a single file, or a single page proofer output file for each proofer page, which only contains one page per file, or several multipage proofer output files, each containing multiple pages in a single file.

It should be noted again that in the preferred embodiment, proofer data 811, in the form of one or more proofer output files comprise references to the location of page pairs in printing data 801, and positioning information in the form of the location and orientation of proofer page masks on each side of each sheet of printing data 801. In the preferred embodiment of the present invention, both the printing data 801 and proofer data 811 are in the GRS format, which is a variant of the GRO format, invented by Barco Graphics, the assignee of the present invention. GRO is short for GRaphic Output. A page description language such as PostScript® (from Adobe Systems, inc.) could also be used. Indeed, simple conversions between GRO or GRS and other popular formats such as PostScript exist. GRO and GRS formats are more efficient to use than PostScript since they are compiled rather than interpreted. A GRS file consists of a header and data parts. One feature of GRO and GRS is good random access in that one can jump immediately to a certain page or internal image. A GRO or GRS file can make a reference to another GRO file, or to an image file such as one in the common TIFF format, and put a clipping mask on it. This clipping feature is used in Impose!™ and in the preferred embodiment of the present invention. How to implement a clipping mask in the proofer data for alternate embodiments that use formats other than GRO or GRS for the proofer data would be clear to those of ordinary skill in the art.

The resulting files of proofer data 811 obtained in this way preferably are sent to a recto verso proofer. This provides, for the example of the sample magazine, eight proof sheets with four pages printed on each sheet, two pages on the recto side and two pages on the verso side. Figure 5 shows these proof sheets, with the value of *proofside* shown underlined to the left of each side of each proof sheet. For example, the sixth proof sheet consists of recto side 503 and verso side 505, having *proofside* values 11 and 12, respectively, these *proofside* values shown by underlined numbers 507 and 509 respectively.

Once the proof pages are printed, the first four proof sheets are collated, and the resulting pile of proof sheets, containing the first section, is folded in the

middle. The last four proof sheets are collated and the resulting pile, containing the second section, is folded in the middle. When the two sections are collated, they serve as model for the printed magazine.

According to a preferred embodiment of the present invention, extra marks are added in step 809 to the data of the proofer output file. These extra marks are to aid checking for correct placement and for version control. In different embodiments, the identification marks include one or more of

- the name of the page,
- the date of proofing,
- a rectangle around the unfinished format,
- a rectangle around the finished format, and
- a rectangle around the text area of the page.

There is a still a small risk with the above described embodiment of the present invention that one can overwrite or change by mistake the images or pages or sheets after they are proofed, but before they are imaged as imposed sheets for final printing. In such a case, the printed book would not match the proof. One improved embodiment includes locking. Another includes versioning.

Yet another embodiment of marking step 809 avoids the complications and additional difficulty-of-use that locking or versioning introduces. In such an embodiment, step 809 comprises adding a "magic number" during output. This magic number is a function of the images, pages and sheets actually used to make the proof, in the case of proofing, and actually used to output the printing data, in the case of preparing the film or plate. The number is placed in the proofing pages and in the printing data output (the film or plate). The function is chosen so that if the magic number on the film or plate is the same as on the proof, there is an extremely high likelihood that these were made using the same data, and if the magic number on the film or plate does not match that on the proof, then there is certainty that the data used to proof is different from that used to prepare final output.

According to this embodiment, the method of the present invention calculates a magic number for a certain file (a proof file or print data file) based on:

- the characters of the file name,
- the characters of the file names of all the external references,
- the creation times of the file and the external references, and
- the number of blocks in the file and in its external references.

The creation date is not considered as it is not statistically meaningful enough. This method for determining the magic number provides a statistically small chance of synonyms, especially between visually similar proofs/films. Other mappings are possible within the scope of the present invention. The particular method used comprises:

- adding up the chr values of the characters in the filename (minus 64 so that the chr for "A"=1) and converting the sum to base 36;
- converting the creation time to seconds, and adding these up, then converting the sum to base 36; and
- adding up the block count of all the files and converting the sum to base 36.

Two options are offered, high precision and low precision. In the high precision version, all three numbers are returned and output on the proof and printer output sheets, separated by a slash. With low precision option, all three numbers are added and then converted to base 36, and this single number is printed. Because of rounding errors in the case of exponential figures, a counter is reset to 0 when it overflows (> 999,999,999).

An apparatus for performing imposition proofing is shown in Figure 10. The apparatus, shown in box 1001, preferably is interfaced to bus subsystem 15 of computer system 10, through which it takes as input printing data 801 which preferably resides in one or more files in file system 25 of computer system 10. The output of the apparatus of the present invention generates proofer data 811,

and preferably writes such data via bus subsystem 15 into one or more files which preferably are located in file system 25 of computer system 10.

The apparatus of the present invention comprises means 1003 for selecting from printing data 811 those pages positioned before the middle of each section. The apparatus also includes positioning means 1005 coupled to selecting means 1003, for positioning the selected pages together with their partner pages on a side of a proof page, and outputting that positioning information as part of proofer data 811. The apparatus may also include order determining means 1007 coupled to selecting means 1003, for determining the logical place (the order) for the proof page side containing the selected page, and outputting the ordering information as part of proofer data 811. According to a preferred embodiment of the present invention, the apparatus also includes marking means 1009 coupled to selecting means 1003, for adding extra marks to the proofer data 811, these extra marks determined from the printing data 801 to aid checking for correct placement and for version control.

In the preferred embodiment of the apparatus, elements 1003, 1005, 1007 and 1009 are implemented in the form of computer program instructions operating on processor 12 of computer system 10. Missing from Figure 10 therefore, are such details as the coupling and means for loading these computer program instructions to each of these elements, as well as overall control. How to include such details would be clear to those of ordinary skill in the art. In alternate embodiments, one or more of elements 1003, 1005, 1007 and 1009 may be implemented as special purpose hardware, incorporating for example, application specific integrated circuit ("ASIC") devices and or digital signal processor ("DSP") devices. How to convert an implementation of elements as programs running on a computer system such as computer system 10 into special purpose hardware is well known in the art.

Although this invention has been described with respect to preferred embodiments, those embodiments are illustrative only. No limitation with respect

to the preferred embodiments is intended or should be inferred. It will be observed that numerous variations and modifications may be effected without departing from the true spirit and scope of the novel concept of the invention, and it is intended that the scope of the invention be defined by the claims appended hereto.

CLAIMS

1. A **method** for producing **proofer data** (811) for printing **sides** of a **set of proof sheets** from **printing data** (801) of a **document,** the document having one or more **sections**, each proof sheet having a **recto side** (503) and a **verso side** (505), said printing data (801) comprising **printing information** about printing a **set of pages** onto one or more **print sheets** (1; 2) and about **contents** of the pages in the set of pages, and **imposing information** about how the set of pages are positioned on the print sheets (1; 2), each print sheet (1; 2) including two **print sheet sides** (301, 303; 305, 307), a **verso print sheet side** (303; 307) and a **recto print sheet side** (301; 305), each print sheet side (301; 303; 305; 307) including at least four pages, each proof sheet comprising a **printer spread** of at most two pages, the method comprising:

for the pages of a **particular section** in a **particular print sheet** (1; 2) in said printing data (801),

(a) **selecting a page** in the particular section; and

(b) for the selected page

(i) **determining** the **partner page** in the printer spread which includes the selected page; and

(ii) **generating** proofer data (811) corresponding to the selected page, the corresponding proofer data (811) including **positioning information** for positioning and printing the printer spread which includes the selected page on one side of a proof sheet of the set of proof sheets.

2. The method of claim 1 wherein the corresponding proofer data (811) generated in step (b)(ii) includes a **logical order** of the one side of the proof sheet in the set of proof sheets, said logical order including the ordering of the one side of the proof sheet in the set of proof sheets and whether the one side of the proof sheet is the recto side (503) or the verso side (505).

3. The method of any of the preceding claims, further including **repeating** steps (a) and (b) for each section in the particular print sheet (1; 2) and for each print sheet (1; 2) in the printing data (801).

4. The method of any of the preceding claims wherein the positioning data in the corresponding proofer data (811) includes a **reference** to the printing information in the printing data (801).

5. The method of claim 4 wherein the reference includes a **clipping mask** acting on the printing information, said clipping mask defining a **positioning outline** of the printer spread which includes the selected page.

6. The method of any of claims 4 or 5 further including:

(c) sending the proofer data (811) to a **proofer,** the proofer generating printed sides of the proof sheets using the reference to the printing information to ensure that the same data is used to generate the print sides as is in the printing data (801) containing the pages in said printed sides, the two printed sides of the same proof sheet forming a printed proof sheet.

7. The method of any of the preceding claims wherein said step (a) selects a page which is in the second half of the particular section.

8. The method of any of claims 1 to 6 wherein said step (a) selects a page which is in the first half of the particular section.

9. The method of claim 8 wherein said step (b)(ii) further includes:

determining extra marks from the printing data (801), the extra marks including **aids for checking** and/or **aids for version control**, the extra marks forming part of the corresponding proofer data (811).

10. The method of claim 9 wherein said step (b)(ii) further includes:

adding at least a **subset** of the extra marks to the printing data (801).

11. The method of any of claims 9 or 10, wherein the printing data (801) includes two formats, called the **unfinished format** and the **finished format,** respectively, and wherein the extra marks include one or more of the set which includes the name of one or more of the pages in the printer spread which includes the selected page, the date of generating the proofer data (811), a **rectangle** around the unfinished format which includes the printer spread which includes the selected page, a **rectangle** around the finished format which includes the printer spread which includes the selected page, and a rectangle around any text area of one or more of the pages in the printer spread which includes the selected page.

12. The method of any of claims 9 to 11 wherein the printing information in the printing data (801) includes **references** to the content of the pages in the printing data (801), and wherein the extra marks include a **magic number,** the magic number a **function** of the pages in, the sheets in, and the contents in the printing information of the printing data (801) of the printer spread which includes the selected page, the function chosen so that if the magic number on any print sheets (1; 2) generated from the printing data (801) is the same as on the corresponding proof sheets generated from the proofer data (811), there is an extremely high likelihood that the generated print sheets (1; 2) and the generated corresponding proof sheets were made using the same data, and if the magic number on any print sheets (1; 2) generated from the printing data (801) is not the same as on the corresponding proof sheets generated from the proofer data (811), there is certainty that the

generated print sheets (1; 2) and the generated corresponding proof sheets were made using different data.

13. The method of any of claims 8 to 12, wherein said step (b)(ii) includes **orienting** the printer spread which includes the selected page so that when the selected page is head-up the selected page is located on the left of the one side of the proof sheet for the case of the one side of the proof sheet being the verso side (505) and on the right of the one side of the proof sheet for the case of the one side of the proof sheet being the recto side (503).

14. The method of claim 13 wherein each page in the set of pages has a **logical page number** and wherein said step (b) determines the one side of the proof sheet to be one of the verso side (505) and the recto side (503) depending on the parity of the page number (253) of the selected page.

15. The method of claim 14 wherein the logical page numbers of the pages in the set of pages commence with logical page number one and wherein step (b) determines the one side of the proof sheet to be the verso side (505) for the case of the selected page having an odd logical page number and to be the recto side (503) for the case of the selected page having an even logical page number.

16. The method of any of claims 14 or 15 wherein said step (b) determines the ordering of the one side of the proof sheet to be the ordering that satisfies a **relationship** between the ordering, the logical page number of the selected page, and the number of pages in all sections previous to the section containing the selected page.

17. The method of claim 16 wherein the ordering of each side of the proof sheets is represented by a **logical proof side number** (507; 509) commencing with the first proof sheet in order having logical proof side number one, and wherein the relationship is that the logical proof side number of the one side

of the proof sheet is equal to the logical page number of the selected page less one half of the number of pages in all sections previous to the section containing the selected page.

18. The method of any of claims 3 to 17, wherein each printer spread includes a **spine location,** the method further including

(c) **sending** the proofer data (811) to a **proofer,** the proofer generating printed sides of the proof sheets, the two printed sides of the same proof sheet forming a **printed proof sheet;**

(d) **folding** the printed proof sheets at the spine location; and

(e) **collating** the printed proof sheets to form at least one section of the document.

19. A **method** for producing **proofer data** (811) for printing **sides** of a **set of proof sheets** from **printing data** (801) of a **document,** the document having one or more **sections,** each **proof sheet** having a **recto side (503)** and a **verso side (505),** said printing data (801) comprising **printing information** about printing a **set of pages** onto one or more **print sheets** (1; 2) and about the contents of the pages in the set of pages, and **imposing information** about how the set of pages are positioned on the print sheets (1; 2), each print sheet (1; 2) including two **print sheet sides (301, 303; 305, 307),** a **verso print sheet side** (303; 307) and a **recto print sheet side** (301; 305), each print sheet side (301; 303; 305; 307) including at least four pages, each proof sheet comprising a **printer spread** of at most two pages, the method comprising:

for the pages of a **particular section** in a **particular print sheet (1; 2)** in said printing data (801),

(c) choosing a **first page of said** particular section;

(d) for the chosen page,

(i) **determining** if the chosen page is in the first half of the particular section, and if the chosen page is in the first half of the particular section,

determining the printer spread which includes the chosen page and **positioning** the chosen page in the printer spread so that when the chosen page is head-up, the chosen page is located on the left of the one side of the proof sheet and the printer spread which includes the chosen page also includes the page immediately to the right of the chosen page in the printing data (801) for the case of the one side of the proof sheet being the verso side (505) and chosen page is located on the right of the one side of the proof sheet and the printer spread which includes the chosen page also includes the page immediately to the left of the chosen page in the printing data (801) for the case of the one side of the proof sheet being the recto side (503), and

determining the logical order of the proof side on which the chosen page is located;

(e) **choosing** a **next page** in the particular section and **repeating** step (d);

(f) **repeating** step (e) until all pages in the particular section have been chosen; and

(g) **repeating** steps (c) to (f) until all pages in the printing data (801) have been chosen.

20. An apparatus for producing **proofer data** (811) for printing **sides** of a **set of proof sheets** from **printing data** (801) of a **document,** the document having one or more **sections**, each proof sheet having a **recto side** (503) and a **verso side** (505), said printing data (801) comprising **printing information** about printing a **set of pages** onto one or more **print sheets** (1; 2) and about **contents** of the pages in the set of pages, **and imposing information** about how the set of pages are positioned on the print sheets (1; 2), each print sheet (1; 2) including two **print sheet sides** (301, 303; 305, 307), a **verso print sheet side** (303; 307) and a **recto print sheet side** (301; 305), each print sheet side (301; 303; 305; 307) including at least four pages, each proof sheet comprising a **printer spread** of at most two pages, the apparatus having **a central processor unit (CPU)** (12), a **memory** (17), and a **file system** (25) containing the printing data (801), the apparatus comprising:

(a) **selection means** (1003) using the CPU (12) and the memory (17), configured to **select** a page in a **particular section** of the printing data (801); and

(b) **positioning means** (1005), using said CPU (12) and the memory (17), configured to **determine** the printer spread which includes the selected page and to **generate** proofer data (811) corresponding to the selected page, the corresponding proofer data (811) including **positioning information** for positioning and printing the printer spread which includes the selected page on one side of a proof sheet of the set of proof sheets.

21. The apparatus of claim 20 further including:

(c) **order determining means** (1007), using said CPU (12) and the memory (17), configured to **determine** a **logical order** of the one side of the proof sheet in the set of proof sheets and to **include** the logical order as part of the corresponding proofer data (811), the logical order including

the ordering of the one side of the proof sheet in the set of proof sheets and whether the one side of the proof sheet is the recto side (503) or the verso side (505).

22. The apparatus of any of claims 20 or 21 wherein the positioning data in the corresponding proofer data (811) includes a **reference** to the printing information in the printing data (801).

23. The apparatus of claim 22 wherein the reference includes a **clipping mask** acting on the printing information, said clipping mask defining a **positioning outline** of the printer spread which includes the selected page.

24. The apparatus of any of claims 20 to 23 wherein said selection means (1003) is configured to select a page which is in the second half of the particular section.

25. The apparatus of any of claims 20 to 23 wherein said selection means (1003) is configured to select a page which is in the first half of the particular section

26. The apparatus of any of claims 20 to 25, further including:

(d) **marking means** (1009), using the CPU (12) and the memory (17), configured to add **extra marks** from the printing data (801) into the proofer data (811), the extra marks including **aids for checking** and/or **aids for version control.**

27. The apparatus of claim 26 wherein the marking means add at least a subset of the extra marks to the printing data (801).

28. The apparatus of any of claims 26 or 27 wherein the printing data (801) includes two **formats,** called the **unfinished format** and the **finished**

format, respectively, and wherein the extra marks include one or more of the set which includes the name of one or more of the pages in the printer spread which includes the selected page, the date of generating the proofer data (811), a rectangle around the unfinished format which includes the printer spread which includes the selected page, a rectangle around the finished format which includes the printer spread which includes the selected page, and a rectangle around any text area of one or more of the pages in the printer spread which includes the selected page.

29. The apparatus of any of claims 26 to 28 wherein the printing information in the printing data (801) includes references to the content of the pages in the printing data (801), and wherein the extra marks include a **magic number,** the magic number a **function** of the pages in, the sheets in, and the contents in the printing information of the printing data (801) of the printer spread which includes the selected page, the function chosen so that if the magic number on any print sheets (1; 2) generated from the printing data (801) is the same as on the corresponding proof sheets generated from the proofer data (811), there is a extremely high likelihood that the generated print sheets (1; 2) and the generated corresponding proof sheets were made using the same data, and if the magic number on any print sheets (1; 2) generated from the printing data (801) is not the same as on the corresponding proof sheets generated from the proofer data (811), there is certainty that the generated print sheets (1; 2) and the generated corresponding proof sheets were made using different data.

30. The apparatus of any of claims 25 to 29 wherein the positioning means (1005) also is configured to **orient** the printer spread which includes the selected page so that when the selected page is head-up the selected page is located on the left of the one side of the proof sheet for the case of the one side of the proof sheet being the verso side (505) and on the right of the one side of the proof sheet for the case of the one side of the proof sheet being the recto side (503).

31. The apparatus of claim 30 wherein each page in the set of pages has a **logical page number** and wherein the positioning means (1005) also is configured to determine the one side of the proof sheet to be one of the verso side (505) and the recto side (503) depending on the parity of the page number (253) of the selected page.

32. The apparatus of claim 31 wherein the logical page numbers of the pages in the set of pages commence with logical page number one and wherein the positioning means (1005) also is configured to determine the one side of the proof sheet to be the verso side (505) for the case of the selected page having an odd logical page number and to be the recto side (503) for the case of the selected page having an even logical page number.

33. The apparatus of any of claims 31 or 32 wherein the order determining means (1007) is configured to determine the ordering of the one side of the proof sheet to be the ordering that satisfies a **relationship** between the ordering, the logical page number of the selected page, and the number of pages in all sections previous to the section containing the selected page.

34. The apparatus of claim 33 wherein the ordering of each side of the proof sheets is represented by a **logical proof side number** (507; 509) commencing with the first proof sheet in order having logical proof side number one, and wherein the relationship is that the logical proof side number of the one side of the proof sheet is equal to the logical page number of the selected page less one half of the number of pages in all sections previous to the section containing the selected page.

35. The apparatus of any of claims 20 to 32, further including

(d) a **proofer** coupled to said positioning means (1005) and capable of receiving the proofer data (811).

36. A **computer software product** comprising:

computer readable storage medium with **computer readable code** embodied therein for causing a **computer** to produce **proofer data** (811) for printing **sides** of a **set of proof sheets** from **printing data** (801) of a **document**, the document having one or more **sections**, each proof sheet having a **recto side (503)** and a **verso side (505)**, said printing data (801) comprising **printing information** about printing a **set of pages** onto one or more **print sheets** (1; 2) and about the contents of the pages in the set of pages, and **imposing information** about how the set of pages are positioned on the print sheets (1; 2), each print sheet (1; 2) including two **print sheet sides** (301, 303; 305, 307), a **verso print sheet side** (303; 307) and a **recto print sheet side** (301; 305), each print sheet side (301; 303; 305; 307) including at least four pages, each proof sheet comprising a **printer spread** of at most two pages, and wherein the computer readable code comprises

(a) computer readable program code devices configured to cause said computer to affect a **selection mechanism** configured to select a page in a **particular section** of the printing data (801); and

(b) computer readable program code devices configured to cause said computer to affect a **positioning mechanism** configured to **determine** the printer spread which includes the selected page and to **generate** proofer data (811) corresponding to the selected page, the corresponding proofer data (811) including **positioning information** for positioning and printing the printer spread which includes the selected page on one side of a **proof sheet** of the set of proof sheets.

37. The computer software product of claim 36 wherein the computer readable code further comprises:

(c) computer readable program code devices configured to cause said computer to affect an **order determining mechanism** configured to **determine** a **logical order** of the one side of the proof sheet in the set of

proof sheets and to **include** the logical order as part of the corresponding proofer data (811), the logical order including the ordering of the one side of the proof sheet in the set of proof sheets and whether the one side of the proof sheet is the recto side (503) or the verso side (505).

38. The computer software product of any of claims 36 or 37 wherein the positioning data in the corresponding proofer data (811) includes a reference to the printing information in the printing data (801).

39. The computer software product of claim 38 wherein the reference includes a **clipping mask** acting on the printing information, said clipping mask defining a **positioning outline** of the printer spread which includes the selected page.

40. The computer software product any of claims 36 to 39, wherein said selection mechanism is configured to select a page which is in the second half of the particular section.

41. The computer software product of any of claims 36 to 39, wherein said selection mechanism is configured to select a page which is in the first half of the particular section.

42. The computer software product of any of claims 36 to 41 wherein the computer readable code further comprises:

(d) computer readable program code devices configured to cause said computer to affect a **marking mechanism** configured to add **extra marks** from the printing data (801) into the proofer data (811), the extra marks including **aids for checking** and/or **aids for version control.**

43. The computer software product of claim 42, wherein at least a subset of the extra marks are added into the printing data (801).

44. The computer software product of any of claims 42 or 43 wherein the printing data (801) includes two **formats,** called the **unfinished format** and the **finished format**, respectively, and wherein the extra marks include one or more of the set which includes the name of one or more of the pages in the printer spread which includes the selected page, the date of generating the proofer data (811), a rectangle around the unfinished format which includes the printer spread which includes the selected page, a rectangle around the finished format which includes the printer spread which includes the selected page, and a rectangle around any text area of one or more of the pages in the printer spread which includes the selected page.

45. The computer software product of any of claims 42 to 44, wherein the printing information in the printing data (801) includes references to the content of the pages in the printing data (801), and wherein the extra marks include a **magic number,** the magic number a **function** of the pages in, the sheets in, and the contents in the printing information of the printing data (801) of the printer spread which includes the selected page, the function chosen so that if the magic number on any print sheets (1; 2) generated from the printing data (801) is the same as on the corresponding proof sheets generated from the proofer data (811), there is an extremely high likelihood that the generated print sheets (1; 2) and the generated corresponding proof sheets were made using the same data, and if the magic number on any print sheets (1; 2) generated from the printing data (801) is not the same as on the corresponding proof sheets generated from the proofer data (811), there is certainty that the generated print sheets (1; 2) and the generated corresponding proof sheets were made using different data.

46. The computer software product of any of claims 41 to 45 wherein the positioning mechanism also is configured to **orient** the printer spread which includes the selected page so that when the selected page is head-up the selected page is located on the left of the one side of the proof sheet for the case of the one side of the proof sheet being the verso side (505) and on the

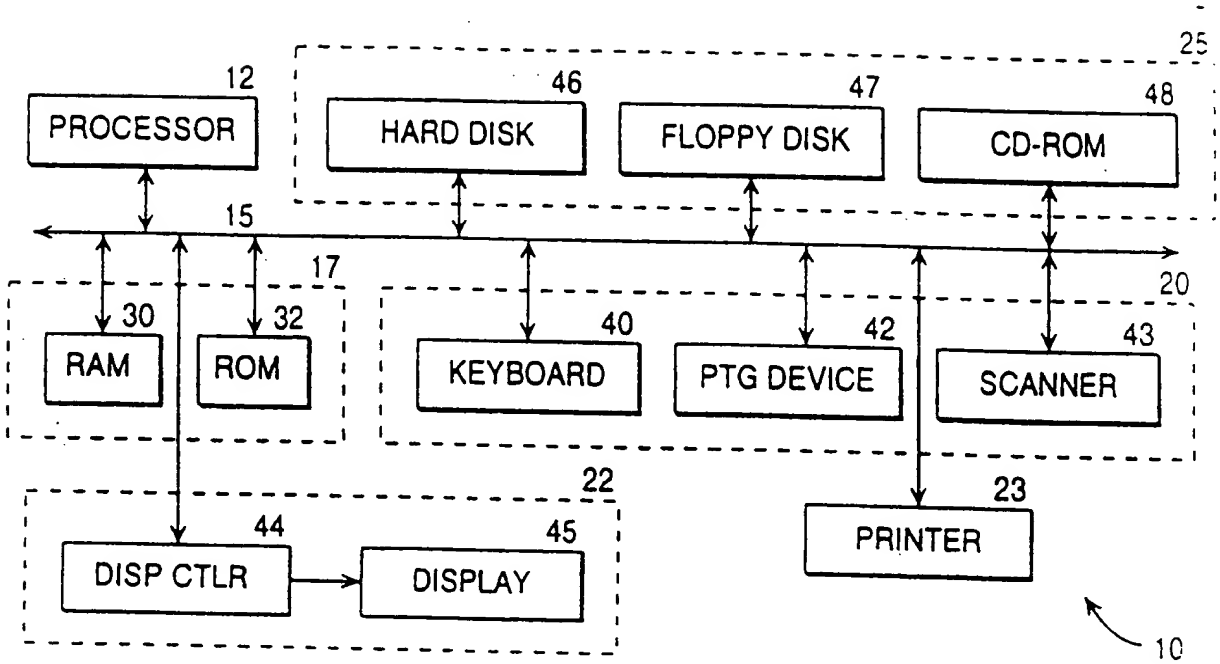
right of the one side of the proof sheet for the case of the one side of the proof sheet being the recto side (503).

47. The computer software product of claim 46 wherein each page in the set of pages has a **logical page number** and wherein the positioning mechanism also is configured to determine the one side of the proof sheet to be one of the side and the recto side (503) depending on the parity of the page number (253) of the selected page.

48. The computer software product of claim 47 wherein the logical page numbers of the pages in the set of pages commence with logical page number one and wherein the positioning mechanism also is configured to determine the one side of the proof sheet to be the verso side (505) for the case of the selected page having an odd logical page number and to be the recto side (503) for the case of the selected page having an even logical page number.

49. The computer software product of any of claims 47 or 48 wherein the order determining mechanism is configured to determine the ordering of the one side of the proof sheet to be the ordering that satisfies a relationship between the ordering, the logical page number of the selected page, and the number of pages in all sections previous to the section containing the selected page.

50. The computer software product of claim 49 wherein the ordering of each side of the proof sheets is represented by a **logical proof side number** (507; 509) commencing with the first proof sheet in order having logical proof side number one, and wherein the relationship is that the logical proof side number of the one side of the proof sheet is equal to the logical page number of the selected page less one half of the number of pages in all sections previous to the section containing the selected page.



(PRIOR ART)

Figure 1

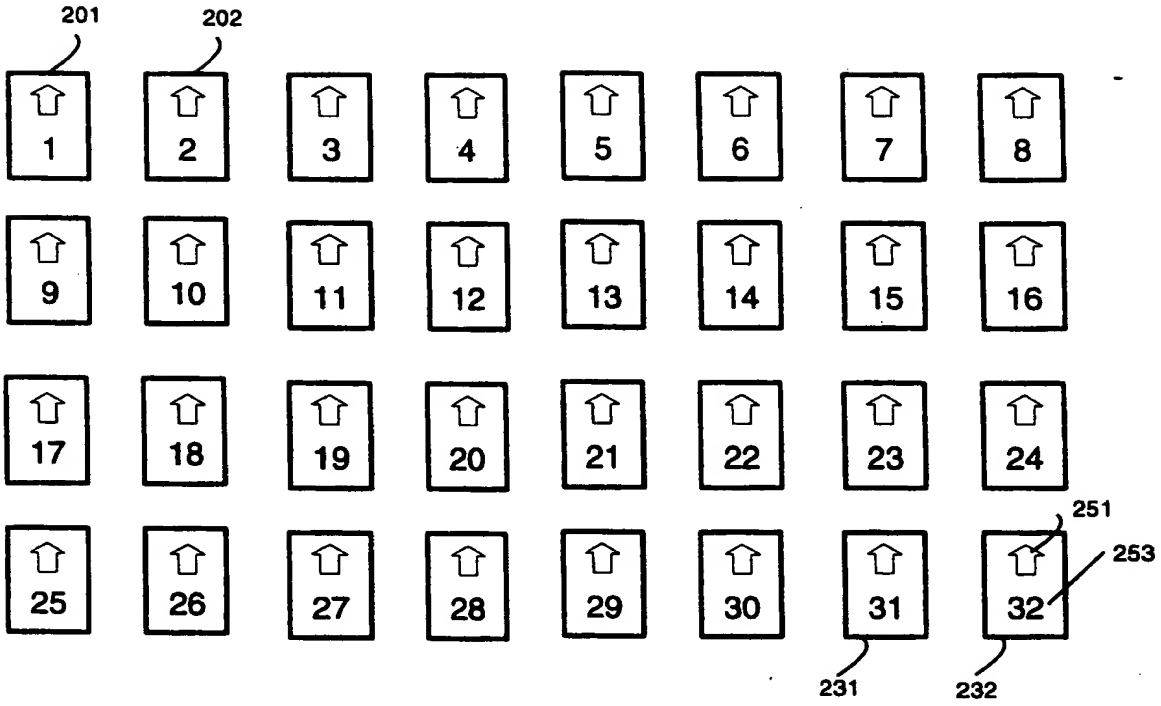


Figure 2 (Prior Art)

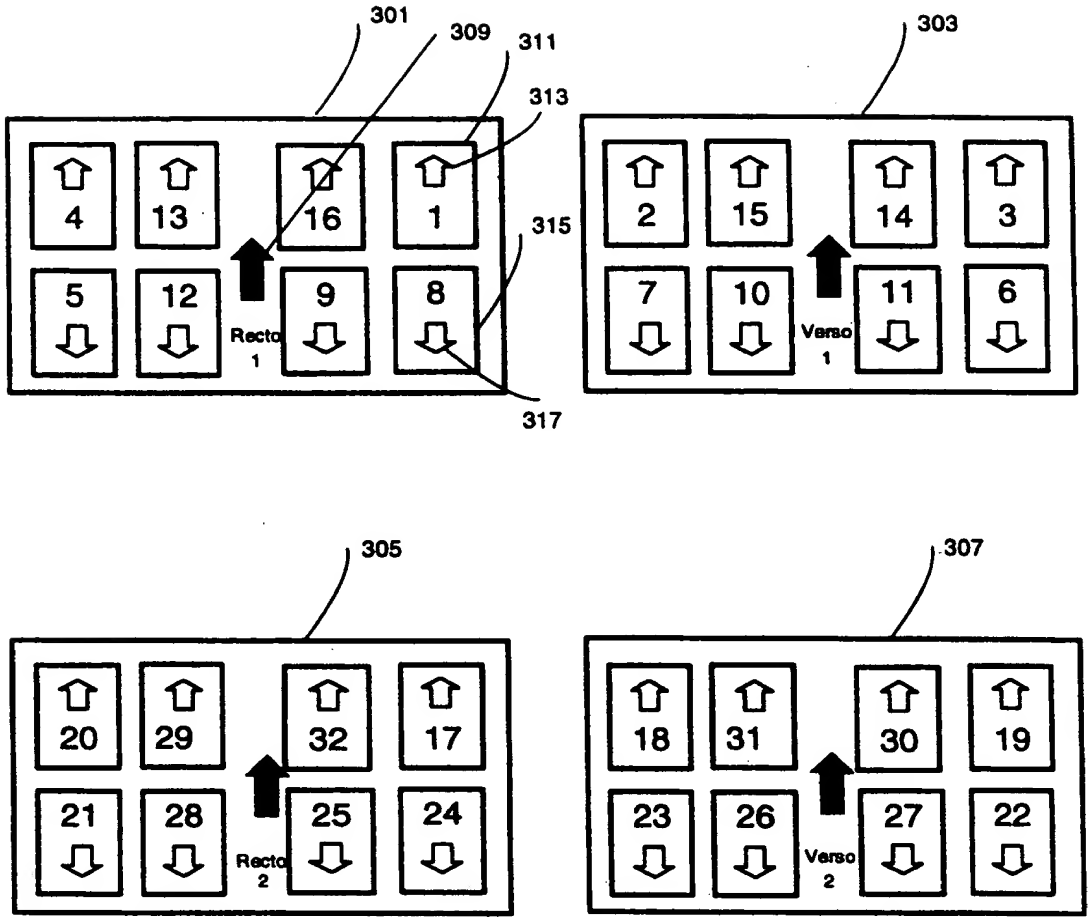


Figure 3 (Prior Art)

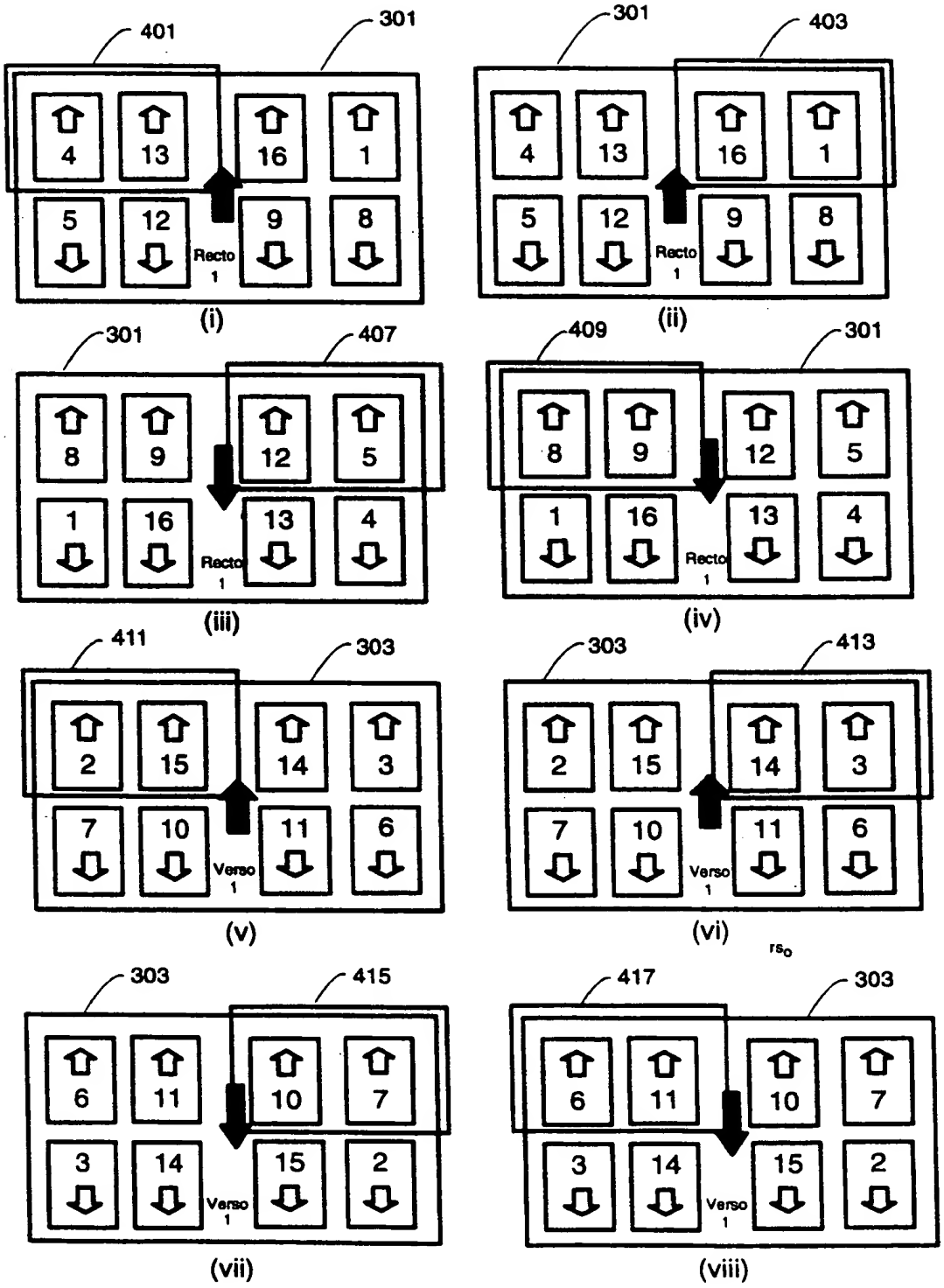

401
301
4
13
16
1
5
12
9
8
Recto 1
(i)
301
403
4
13
16
1
5
12
9
8
Recto 1
(ii)
301
407
8
9
12
5
1
16
13
4
Recto 1
(iii)
409
301
8
9
12
5
1
16
13
4
Recto 1
(iv)
411
303
2
15
14
3
7
10
11
6
Verso 1
(v)
303
413
2
15
14
3
7
10
11
6
Verso 1
(vi)
303
415
6
11
10
7
3
14
15
2
Verso 1
(vii)
417
303
6
11
10
7
3
14
15
2
Verso 1
(viii)

Figure 4(a)

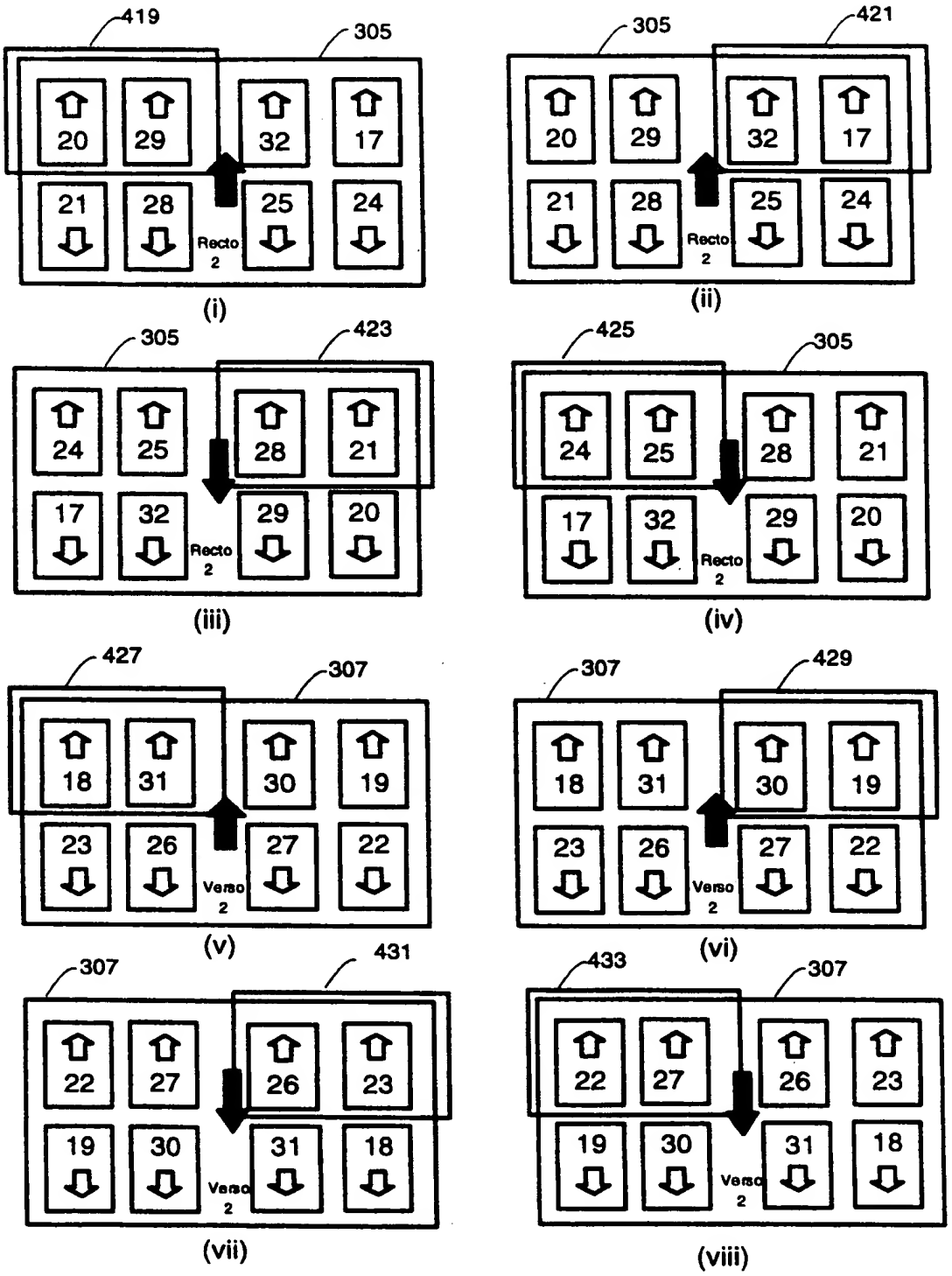

419
305
20
29
32
17
21
28
25
24
Recto 2
(i)
305
421
20
29
32
17
21
28
25
24
Recto 2
(ii)
305
423
24
25
28
21
17
32
29
20
Recto 2
(iii)
425
305
24
25
28
21
17
32
29
20
Recto 2
(iv)
427
307
18
31
30
19
23
26
27
22
Verso 2
(v)
307
429
18
31
30
19
23
26
27
22
Verso 2
(vi)
307
431
22
27
26
23
19
30
31
18
Verso 2
(vii)
433
307
22
27
26
23
19
30
31
18
Verso 2
(viii)

Figure 4 (b)

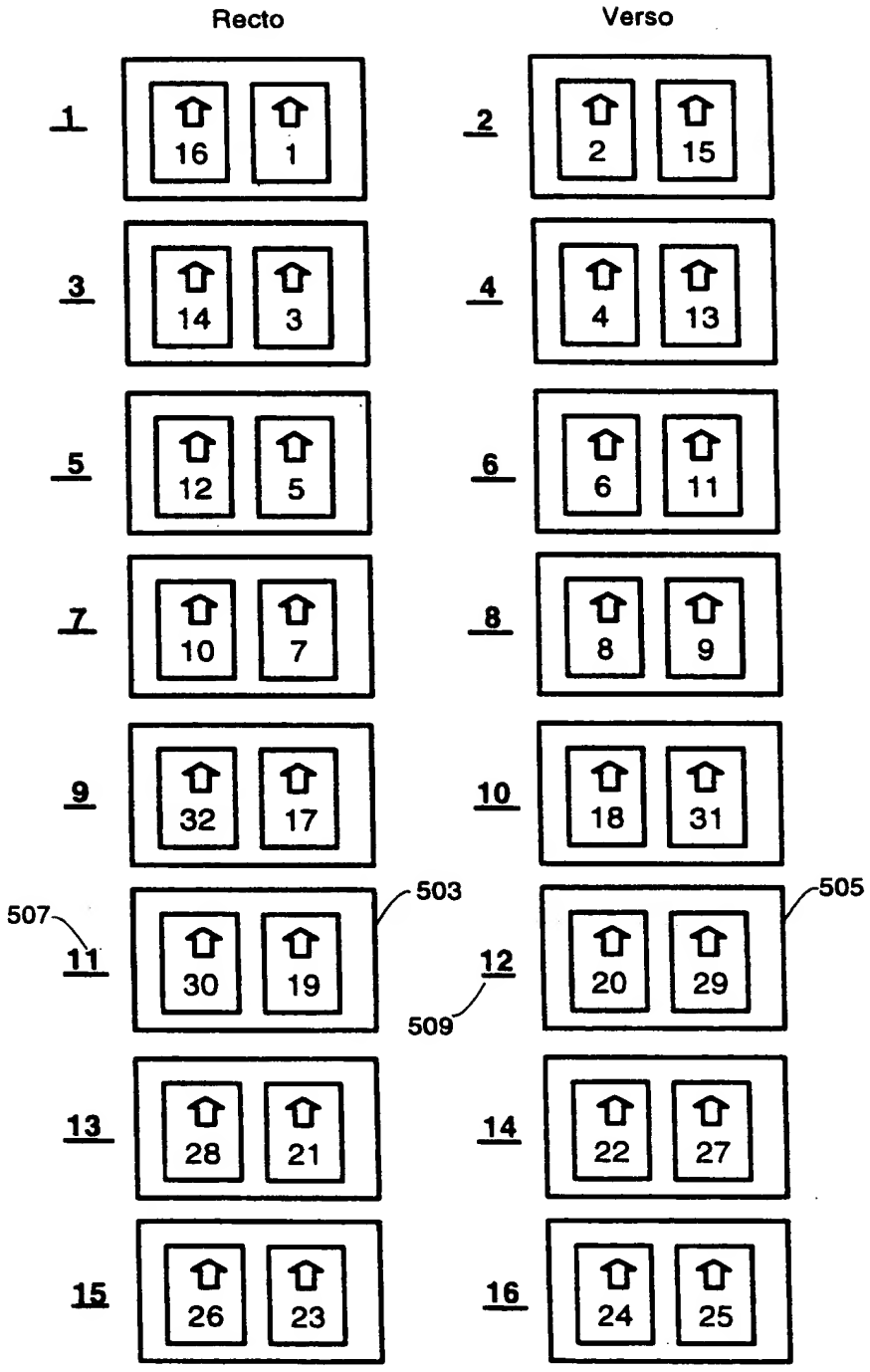

Recto
Verso
1
16
1
2
2
15
3
14
3
4
4
13
5
12
5
6
6
11
7
10
7
8
8
9
9
32
17
10
18
31
503
505
507
11
30
19
12
20
29
509
13
28
21
14
22
27
15
26
23
16
24
25

Figure 5

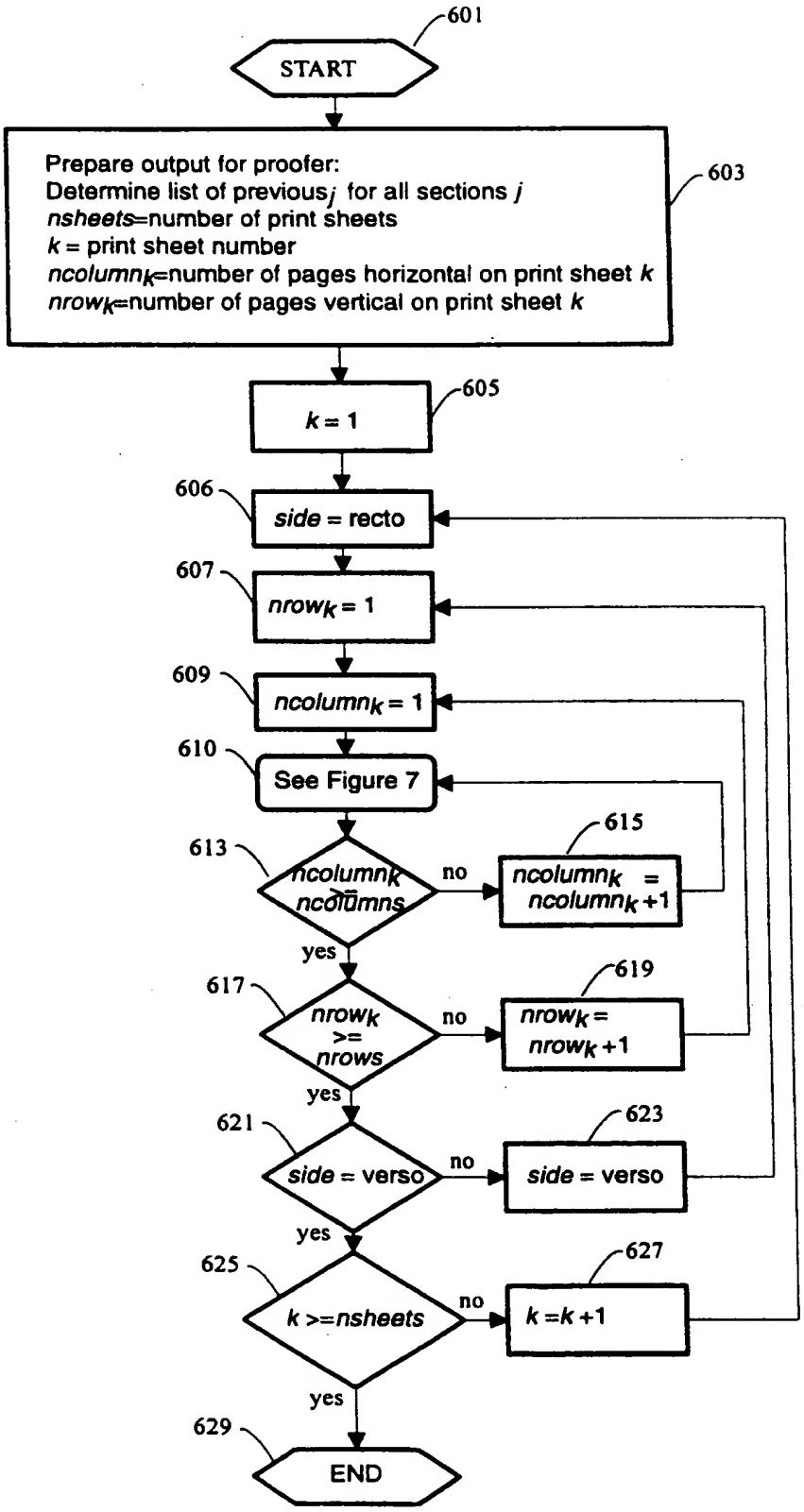

601
START
Prepare output for proofer:
Determine list of previous$_j$ for all sections j
$nsheets$=number of print sheets
k = print sheet number
$ncolumn_k$=number of pages horizontal on print sheet k
$nrow_k$=number of pages vertical on print sheet k
603
$k = 1$
605
606
$side$ = recto
607
$nrow_k = 1$
609
$ncolumn_k = 1$
610
See Figure 7
613
$ncolumn_k >= ncolumns$
no
615
$ncolumn_k = ncolumn_k + 1$
yes
617
$nrow_k >= nrows$
no
619
$nrow_k = nrow_k + 1$
yes
621
$side$ = verso
no
623
$side$ = verso
yes
625
$k >= nsheets$
no
627
$k = k + 1$
yes
629
END

Figure 6

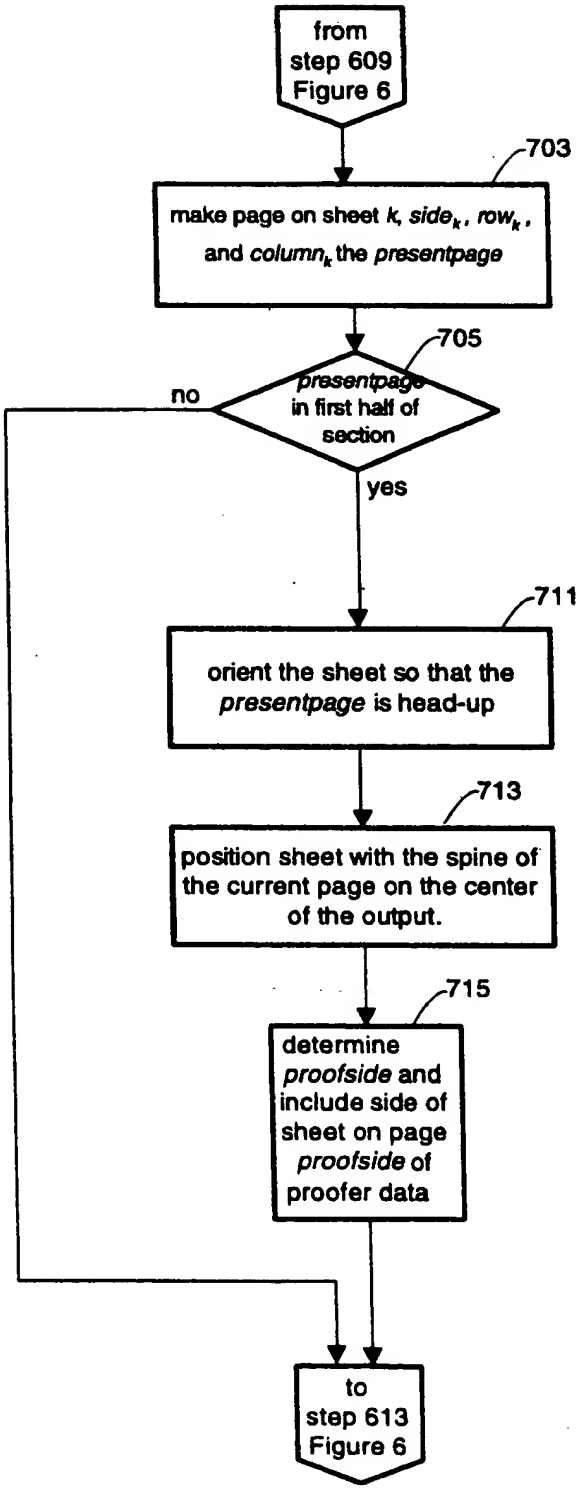

from step 609 Figure 6
703
make page on sheet k, $side_k$, row_k, and $column_k$ the presentpage
705
presentpage in first half of section
no
yes
711
orient the sheet so that the presentpage is head-up
713
position sheet with the spine of the current page on the center of the output.
715
determine proofside and include side of sheet on page proofside of proofer data
to step 613 Figure 6

Figure 7

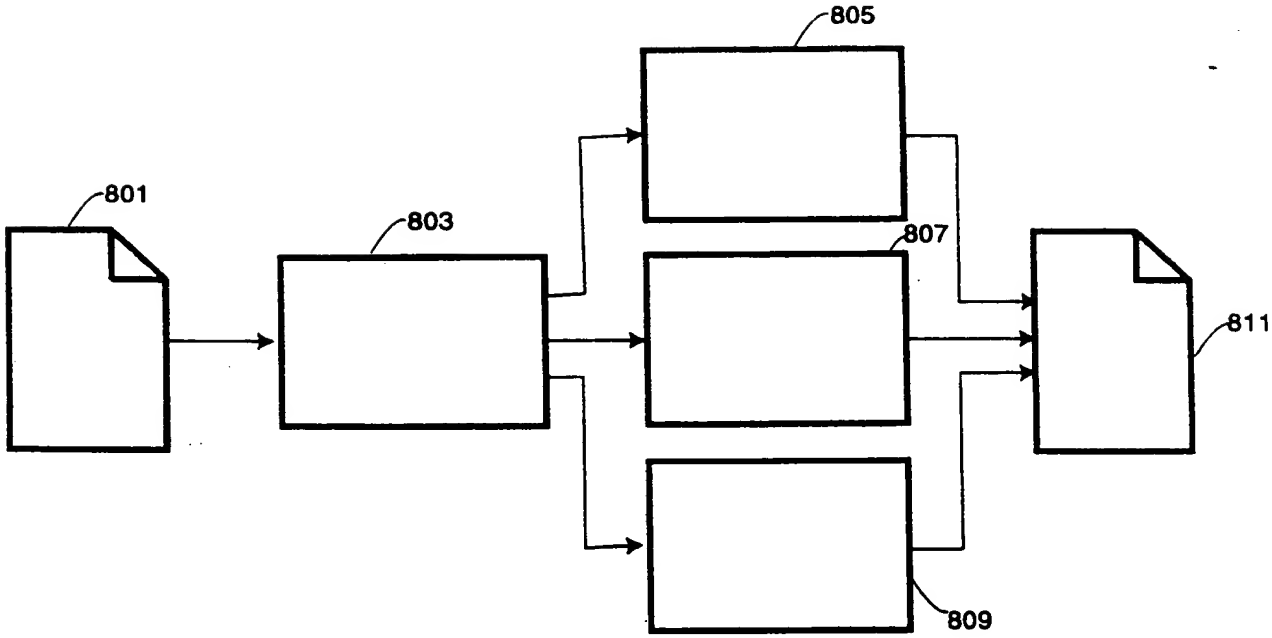


Figure 8

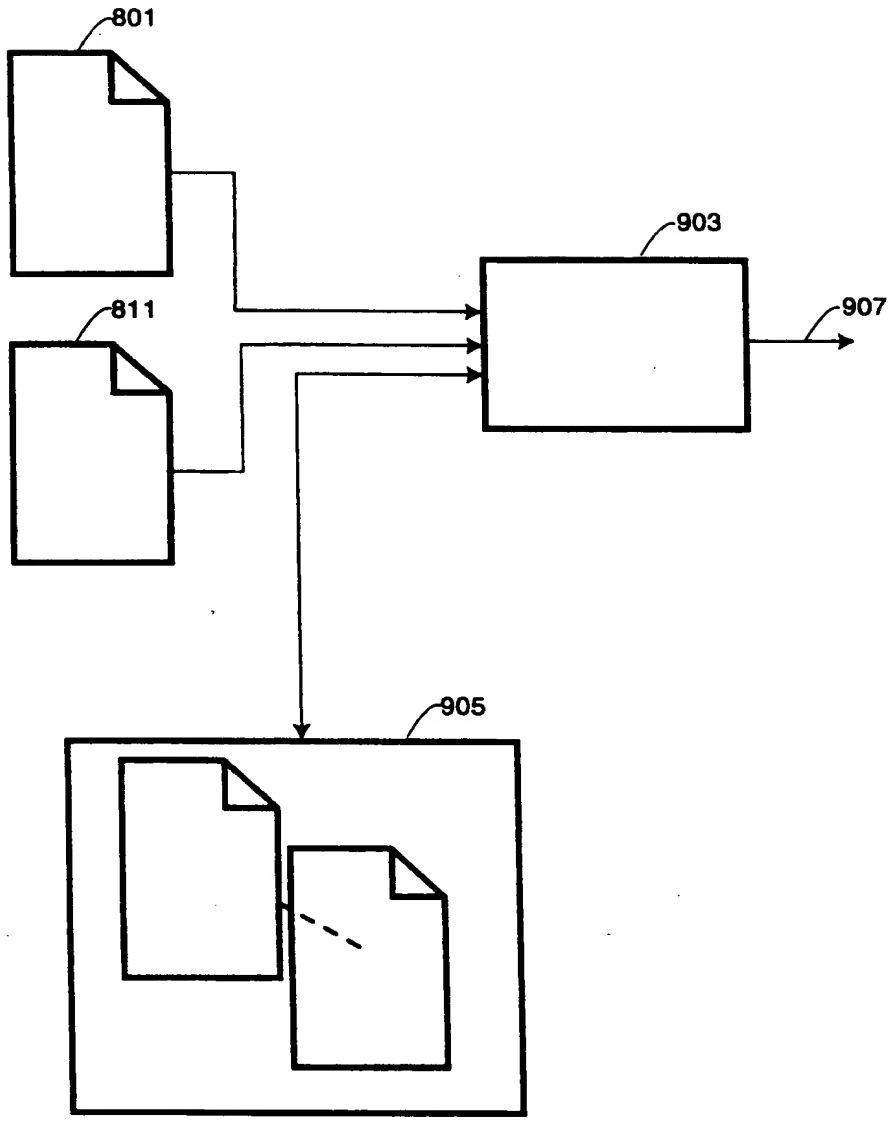


Figure 9

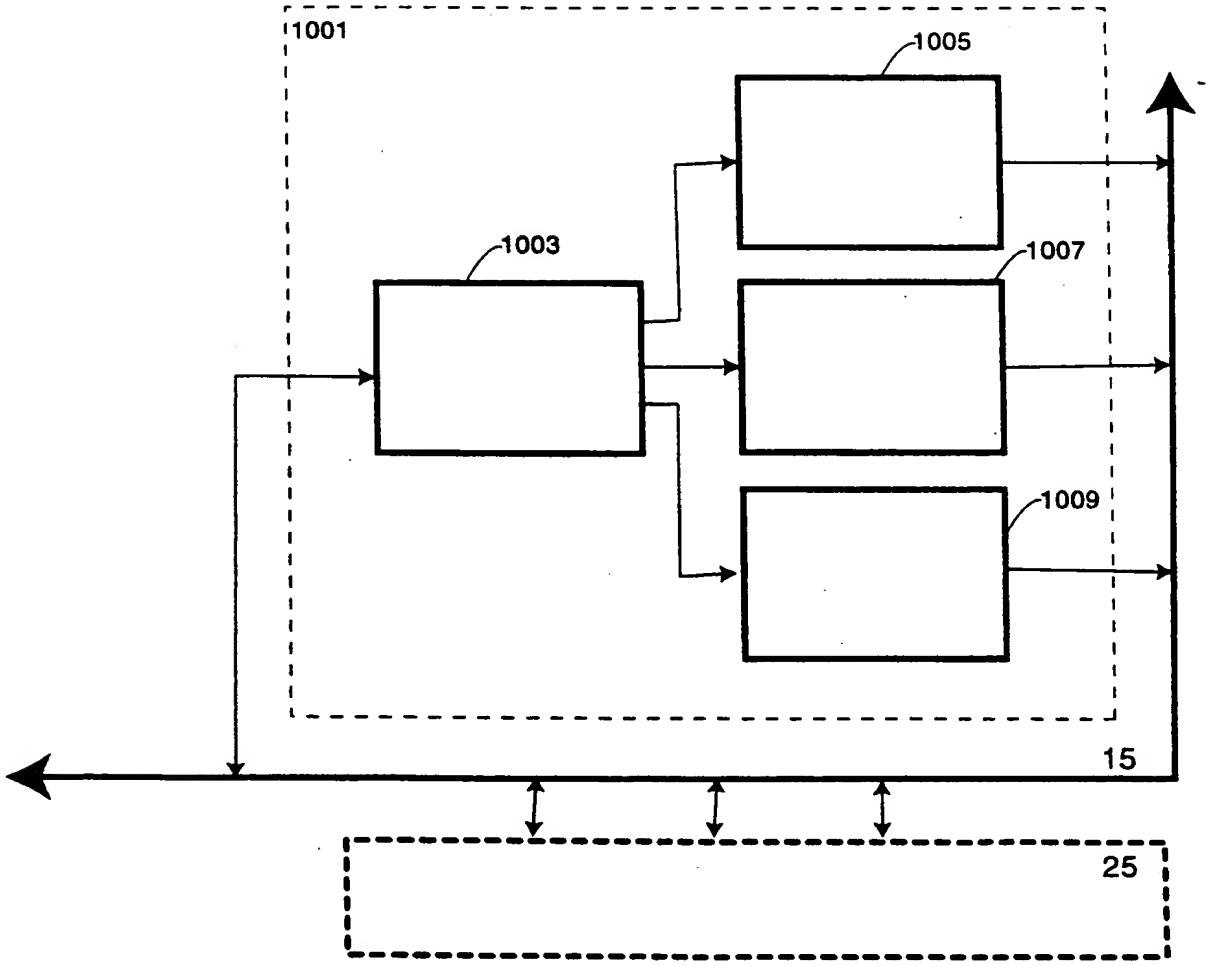


Figure 10

INTERNATIONAL SEARCH REPORT

International Application No
PCT/BE 98/00041

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B41F33/00 G03F1/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B41F G03F B41B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 105 468 A (TOPPAN PRINTING CO LTD) 18 April 1984 see abstract; figures see page 14, line 1 - page 16, line 21	1,19,20, 36
A	EP 0 643 330 A (DAINIPPON SCREEN MFG) 15 March 1995	1,19,20, 36
A	EP 0 557 008 A (SCITEX CORP LTD) 25 August 1993	1,19,20, 36

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
1 July 1998	08/07/1998

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Helpiö, T.

1

INTERNATIONAL SEARCH REPORT

information on patent family members

Inte[redacted] Application No
PCT/BE 98/00041

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0105468 A	18-04-1984	JP 59214032 A	03-12-1984
		JP 1602136 C	26-03-1991
		JP 2027943 B	20-06-1990
		JP 59062153 A	09-04-1984
		DE 3377905 A	13-10-1988
EP 0643330 A	15-03-1995	JP 7072608 A	17-03-1995
		JP 8029959 A	02-02-1996
		US 5604579 A	18-02-1997
EP 0557008 A	25-08-1993	JP 6027631 A	04-02-1994